in the desired range, for example, 0.025 inches. The trailing edge of the forebody section **86**, as shown, extends only about 60% to 80% of the axial length of the probe section, and tapers in thickness from the leading edge to the trailing edge, as shown in FIG. **14**. The taper of the forebody from front to rear provides for a smooth acceleration of the airflow. The forebody **86** will divide the flow so that as air flows around the cylindrical probe section **82** in the direction indicated by arrow **89**, it will create lower pressure on the leeward or downstream side areas indicated generally at **87**, that is less than the pressure created on the aircraft skin **84**. The addition of the forebody alters the pressure distribution around the probe and reduces the magnitude of the shed vortices and allows the flow to remain attached to the probe section **82** longer. Thus, areas of the probe section will be colder than what would exist without the influence of the forebody. In addition, the forebody acts like a shield to protect portions of the probe section and reduce the overall aerodynamic heating effects due to conduction. The circuitry **88** will provide an advance notice of icing conditions, before ice accretes on the aircraft.

FIGS. **15, 16** and **17** illustrate a further embodiment of the present invention comprising a mounting flange **90**, that has a strut and probe assembly **91** including a strut **93** and a cylindrical probe section **92** protruding from the strut. The strut and probe assembly **91** is mounted in a selected position relative to a portion of the aircraft skin **98**. The cylindrical probe section **92** would have suitable circuitry associated therewith for vibrating it and sensing changes in frequency, as previously explained. In this form of the invention, the cylindrical probe section **92** has an axially extending rib section **94** forming part of the probe **92** along one side thereof. The rib section **94** is on a lateral side relative to the direction of airflow, which is indicated by the arrow **96**. The rib section **94** will cause flow separation around the probe section **92**. Because of flow separation at the rib, an uneven or asymmetric pressure distribution will occur when the orientation of the flow is not parallel to a line connecting the front of the probe assembly to the back. Assuming the stagnation line on the probe assembly is closer to the rib **94** than it would be under perpendicular flow (this points out the need to carefully place and orient the probe assembly) the effect of the rib **94** is to effectively provide a condition where there is orientation discrimination not present in the conventional flows. Areas of the probe surface will be at a lower pressure than the aircraft skin, and thus at a lower temperature than the surrounding airfoil surface or aircraft surface **98**.

FIG. **18** is a modified form of the invention. A strut and probe assembly **99** having an airfoil shaped strut **98** and a cylindrical probe **100** with a circular cross section. The strut and probe assembly **99** is mounted onto a suitable support flange **102**, and has an axis indicated at **107** that inclines in downstream direction relative to an axis **106** perpendicular to the aircraft surface **101**. The airflow direction for this sensor is shown at **108**.

FIG. **19** shows a strut and probe assembly **113** with an airfoil shaped strut **111** and a cylindrical probe **112** that is mounted onto the strut **111**. The strut and probe assembly **113** is held in place with a flange **114**. The cylindrical probe has an axis **116** which inclines in upstream direction relative to an axis **118** perpendicular to the aircraft skin **120**. The probe **112** again is a circular cross section cylinder. The airflow direction is shown by arrow **117**.

The inclination of the strut and probe assembly in either a forward or rearward-swept configuration as shown in FIG. **18** or **19** alters the pressure distribution about the probe through an increase in the spanwise flow (fore and aft direction) along the probe. This spanwise flow reduces the recovery along the leading edge of the probe while helping to break up the vortices shed in the wake of the probe. The region of lower pressure will also have lower temperatures than the aircraft skin, which causes ice to accrete on the probe before it accretes on adjacent aircraft surfaces.

The invention thus provides probe orientation and configuration to lower the pressure and temperature on portions of the probe surface to cause ice to accrete on the probe before the aircraft surface accretes ice.

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

What is claimed is:

1. An ice detector for providing a signal indicating ice formation, said ice detector comprising a probe assembly protruding into an airstream and supported relative to a surface of a structure subject to icing, the airstream moving past said surface and said probe assembly, and said probe assembly including sections forming structural portions that provide an area of lower pressure to a surface portion of the probe assembly than on the structure resulting in lower temperature on surfaces of the probe assembly than on the structure.

2. The ice detector of claim **1**, wherein sections of said probe assembly comprises a body member positioned adjacent to at least one of the upstream and downstream sides of the probe assembly.

3. The ice detector of claim **2**, wherein said body member is positioned on an upstream side of a cylindrical probe section, said body member having an edge tapered from a surface on which the probe assembly is mounted toward an outer end of the cylindrical probe section.

4. The ice detector of claim **2**, wherein probe assembly includes a cylindrical probe section and wherein said body member is positioned on a downstream side of the cylindrical probe section, and extends along a length of the cylindrical probe section a selected amount.

5. The ice detector of claim **4**, wherein said body member extends substantially 60% to 80% of the length of the cylindrical probe section along an edge of the body member adjacent to the cylindrical probe section.

6. The ice detector of claim **5**, wherein said body member has a width that is a substantial portion of the diameter of the cylindrical probe section, and an edge of the body member being recessed to receive a portion of the cylindrical probe section to maintain a space between the cylindrical probe section and the leading edge.

7. The ice detector of claim **6**, wherein the space between the leading edge of the body member and a surface of the cylindrical probe section is in the range of 0.025 inches.

8. The ice detector of claim **1**, wherein said probe assembly comprises an airfoil cross sectional shape with a rounded section of the probe assembly facing the direction of airflow.

9. The ice detector of claim **8**, wherein said airfoil cross sectional shape probe assembly is positioned on an aircraft comprising the structure, the airfoil cross-sectional shape probe assembly having an angle of attack that produces a lower pressure than an aircraft wing.

10. The ice detector of claim **1**, wherein said probe assembly includes a structure that maintains a portion of the probe assembly surface at a lower temperature than a protected surface of the aircraft.

11. The ice detector of claim **1**, wherein the probe assembly includes a probe that has a longitudinal axis

protruding into the airstream, the axis being inclined at an angle other than perpendicular to a direction of flow of the airstream moving past the probe.

12. The probe assembly of claim 11, wherein the longitudinal axis inclines so an outer end of the probe inclines in direction into the airstream.

13. The probe assembly of claim 11, wherein an outer end of the probe inclines in a downstream direction.

14. An ice detector for a structural airfoil comprising a probe assembly extending from an air vehicle and having a longitudinal length generally parallel to the longitudinal length of a structural airfoil of the air vehicle and said probe assembly having an airfoil-shaped cross section and being oriented so that the pressure field on the probe assembly airfoil shape provides a lower minimum pressure than a minimum pressure on a structural airfoil of the air vehicle at a desired angle of attack of the structural airfoil.

15. The ice detector of claim 14, wherein said structural airfoil comprises a wing, and the angle of attack of the airfoil-shaped cross section of the probe assembly is greater than the angle of attack of the aircraft wing, and said probe assembly having a longitudinal axis extending generally parallel to a spanwise dimension of the wing.

16. The ice detector of claim 14, wherein the probe assembly airfoil-shaped cross section is positioned to pro-

vide a critical temperature warmer than the critical temperature of the surface to be protected, the critical temperature being defined as the temperature below which ice will form on a structure in the airstream.

17. A method of providing advance warning of formation of ice on a structure comprising of an ice detector probe assembly, placing the ice detector probe assembly in a position in an airstream, configuring and positioning the ice detector probe assembly so the pressure field around the ice detector probe assembly causes a lower temperature at a location on the surface of the ice detector probe assembly than the temperature on the structure.

18. The method of claim 17, wherein the ice detector probe assembly has an airfoil-shaped cross section and is mounted on an aircraft having a wing with an airfoil shape, and including orienting the airfoil-shaped cross section of the ice detector probe assembly at an angle of attack so that at a selected angle of attack of the wing the airfoil-shaped cross section probe assembly has a lower pressure field at a location on the airfoil-shaped cross section probe assembly than on the wing.

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